Fin for sailing vessel - has two sections with connecting plane on which pivot axis is aligned
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Patent Family

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WO 8809286	A	19881201	WO 88NL26	A	19880527	198849	B
NL 8701265	A	19881216				198902	
AU 8818096	A	19881221				198916	
EP 388403	A	19900926	EP 88905003	A	19880527	199039	

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Cited Patents: BE 894306; DE 2932750; DE 3109307; EP 264279 ; DE 3343579

Patent Details

Patent	Kind	Language	Page	Main IPC	Filing Notes
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Abstract:
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The fin consists of two sections (11) which extend to both sides of a common connecting plane.

The fin (10) is mounted rotationally w.r.t. a rotation axis (9) which is in the common connecting plane. It is adjustable parallel to the centreline (13) of the boat or board (1). The rotation axis is connected by a support arm to the boat or board.

ADVANTAGE - Reduced drag and optimised board attitude.

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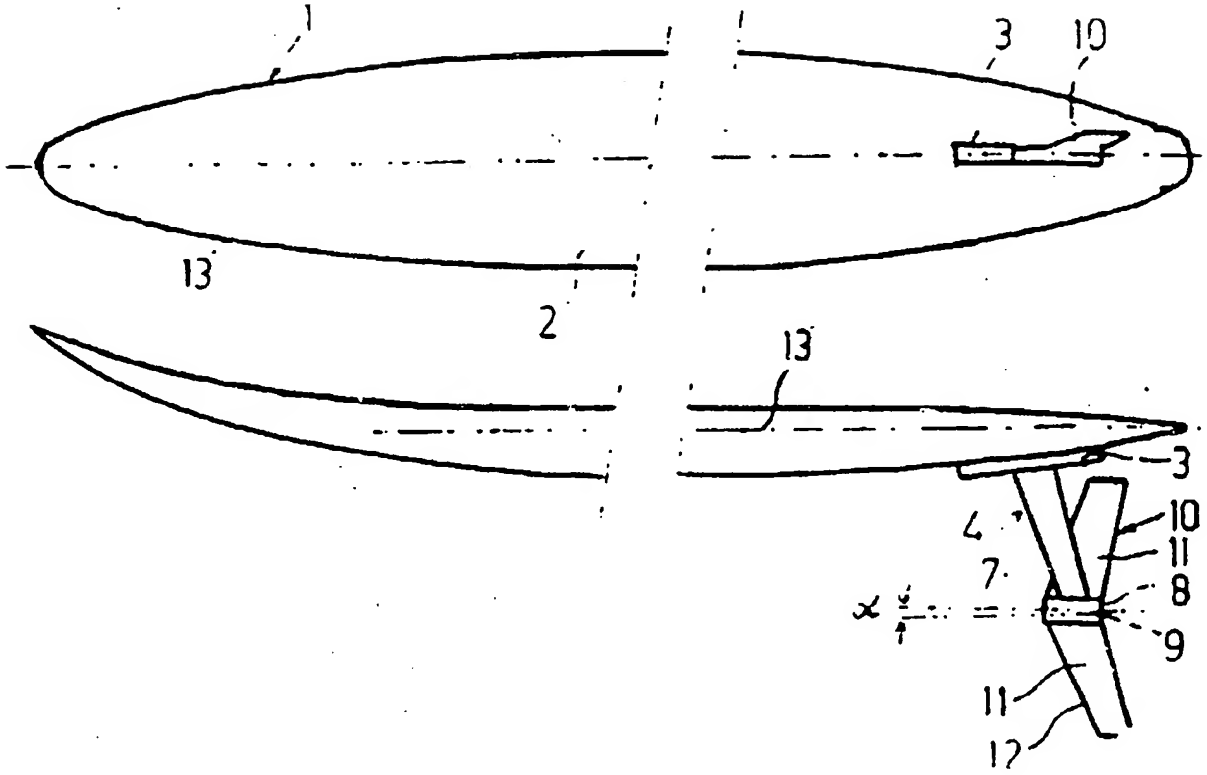

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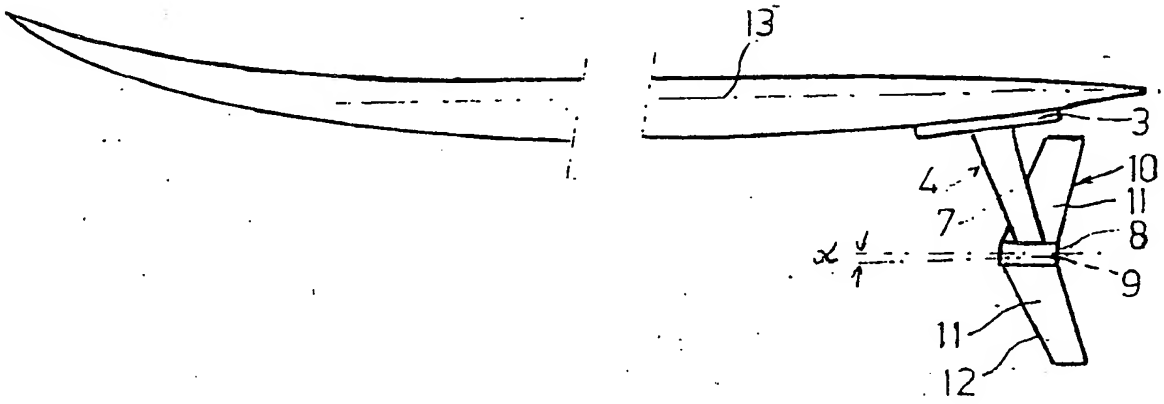

(57) Abstract

Fin (10) or center-board for a sailboat, especially a sailboard, which fin (10) or center-board is positionned in a generally vertical plane when the sailboard is in use, and is composed of two sections (11) at opposite sides of a common connecting plane. The fin (10) is rotatably mounted on a pivot shaft (9) going through the connecting plane and generally parallel to the longitudinal axis (13) of the sailboard. The pivot shaft (9) is connected to the sailboard by means of a support (4).

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Fin, keel, or leeboard for sailing vessels, boats and surf boards equipped with a sail.

This invention relates to fins, keels or leeboards for sailing vessels, boats and especially for surf boards, whose fin, keel or leeboard during use, is mainly in vertical position.

In the following part we will simply discuss a fin or skegg and its application on a wind surf board.

Such fins, up to now have been used in many forms. The fin itself is a device to oppose the side force created by the sail. Due to the side force, the board without a fin would not move into the desired direction, exept when going downwind. The fin will not only give the desired side force compensation and stability of direction but will also cause a certain resistance, which of course should be as low as possible. Nearly always there will be a specific angle between the centreline of the surfboard and the direction of movement of the board. This angle negativly influences not only the attitude and the resistance of the fin but also those of the board.

This invention aims to create a fin with the mentioned functions as optimum as possible under various circumstances.

The fin according the invention is characterised by two wing like sections which extend to both sides of a common connecting plane, whereby the fin is mounted rotationally, with respect to a rotation axis which runs through the connecting plane of the sections and is mainly parallel to the centre line of the board of which its rotation axis is connected to the board by means

It will be a preferable construction to adjust the rotation axis at such distance from the surfboard that the upward positioned section can be approximately rectangular to the board or water plane.

A more specific object is to construct the sections as asymmetrical wing sections.

The hereto known, fixed fins, should always have a symmetrical section, because the board and fin will be, in relation to wind direction and its own direction performing on port and starboard.

The disadvantage of the symmetric hydrofoils, however, is that there is no real optimum relationship between desired liftangle or liftfactor and its resistancefactor; whereas, at relatively small angles of attack: stall can occur, which means; lift subsides and resistance increases strongly.

When according to this invention the transverse section of the fin is asymmetric, it will be possible thanks to the rotation of the fin on its axis, for the fin to take an optimum position in relation to the angle of attack, according the transverse section. In this position the fin will give maximum lift at relative low resistance of the fin and the board.

According the invention it can be made possible that the chord of the profile of the sections makes a certain angle with respect to the rotation axis in such a way that in vertical position the leading edge of the section is further away from the centre line of the board than the trailing edge of the section. This angle can be between 0 and 8 degrees. If the fin according to this invention is in vertical position it can already oppose side forces without having an angle between the centre line of the board and its direction.

Especially for surfboards it can also be made possible to give the centreline of the rotation axis a fixed small angle in respect to the horizontal plane of the surfboard in such a way that the front of the rotation axis is higher that the rear end. This chosen fixed angle can be between 0 and 10 degrees. The application of one or more of these measurements shall assure an optimum use of the fin, whereas the fixed chosen angle can provide the following effect.

The form of a profile is usually such that, at a certain angle of attack, resistance factor and lift will be as optimum as possible. At normal speed one tries to maintain this angle of attack. However, when speed increases, lift will also increase, and it will then be possible to decrease the angle of attack. But with this invention, if the fin is rotated so as to make an angle with the vertical plane, due to the inclined position of the rotation axis, it will be possible to separate the forces into a vertical and horizontal component. The horizontal component, which is the side force component, will compensate the sailforce and the vertical component can be used to lift the board, even in such a way that it will lift the board out of the water, and there will be less friction resistance of the board.

Preferably the fin will be so made that the acting forces will take care of the right positioning of the fin and the maintaining of this position. This can be achieved by giving angle between the two planes in which the sections join together. In this way it will be possible to obtain a self-stabilising effect.

Because the fin is not directly attached to the board, the so called spin-out danger will be decreased.

Such a spin-out is primerily caused by the fact that the passing air-bubbles under the board can be caught into the suction zone of the fin directly under the board, regarding normal fins. These fins, in any case the top zone of them, will cease to function and will make the board very dificult to control. To reduce this effect even more, and to give a certain stability of direction, the two sections can be positioned backwards and become smaller towards their tip. A possible appearance of the fin can be such, that the fin, positioned in a random vertical position can be held; turning into this position or continuing turning occurs against a certain spring force. Using this system, the side force will be compensated first, after which the lifting effect will take place in the right way, also due to the inclining of the rotational axis, and the fin will not turn in an uncontrolled way in rough water.

The turning of the fin from one upright position to another will take place during or directly after reversing the angle of attack and after the unlocking of the fin.

It can be made possible for the rotation axis on which the fin is mounted, to be build up of a torsion shaft, which can turn freely 180 degrees before the torsion force will occur, to either side. The turning of the fin can also be achieved by dimensioning the roots of the sections in such a way that the reversed acting forces will induce a reversed v-positioning of the two sections, so that the fin will turn into the other stable position, an also held in that position.

The fixing of the fin in these positions can be made possible by means which function in relation to speed and/or angles of attack.

One of these means can be a horizontally positioned steering wing, attached to a shaft which is liftable in a parallel sense to the centre plane of the board, whereby the liftable shaft is connected to a pin which is, attached rectangular to the centre line of the board.

Wih this invention the application of the rotational fin could be designed in such a way that the result of the acting forces on the fin is acting in the centre line of the support arm. The support arm then will mainly be imposed on bending forces. It is, however, also possible to mount the fin before or behind the support arm. The support arm then will be imposed on torsion which will change its angle in relation to its torsion resistance and the fin side-force induced by the sail. A surfboard can naturally be provided with more than one fin according to this invention.

Also according to this invention the fin can be combined with one or more static fins. The fin can also be mounted on sailing boats, and on all vessels with sails, in a single form or in addition to already mounted keels, fins, skeggs or leeboards.

In order to make the fin and its appearance more readily understood, reference will now be made to the accompanying drawings, and wherein;

Fig. 1 is a bottom view of a surfboard provided with a fin according to the invention.

Fig. 2 is a side view of the surfboard in Fig. 1.

Fig. 3 is a close up rearside view if Figs. 1 and Fig. 2.

Fig. 4 is cross-sectional view according to line IV-IV of Fig. 3.

Fig. 5 is a side view of the connection between support arm and board.

Fig. 6 is a side view of the partially disposed torsion rotation axis with speed depending lock mechanism.

Fig. 1, 2 and 3 show a symbolic surfboard 1 with bottomplane 2 provided with U profile 3 for mounting the connecting plate 4 of support arm 7 with nuts 5. Connecting plate 4 is provided with a stip 6 which fits into U profile 3. Connecting plate 4 continues into support arm 7 which end into the connection of the bearing support. Axis 9, on which is mounted fin 10, can rotate in bearing 8. Fin 10 consists of two winglike sections 11, which are positioned in a similar way with respect to axis 9 but are having a V-position, as shown in Fig. 3. As shown in Fig. 4 the transversal sections, when asymmetric, will have their curved surfaces facing each other, as we know from wings of airplanes.

As shown in Fig. 2 the leading edge 12 of the profile is constructed for both sections backwards from rotation axis 9. Fig. 2 also shows the possible angle alpha between rotation axis 9 and centreline 13 of board 1.

The varying of this angle can be made possible as shown in Fig. 5. Strip 6 of connecting plate 4 is provided with two holes for screw-threadends 16 on which fit nuts 17. Cam 15, part of U-profile 3 fit into cuts 14 of connectingplate 4. It is obviously possible that, when turning nuts 17, strip 6 changes of angle whereby support 7 aswell as axis 9 will be shifted in the same angle.

Fig. 4 shows the direction of the movement of the board with dart P. Dart R in Fig. 3 shows the direction of the side slip of the board due to the sailforces.

Chord K can make an angle beta as shown in Fig. 4.

Fig. 6 shows the possiblity to mount fin 10 on a axis 19 which is connected to shaft 20, and shaft 20 is at the other end, connected to shaft 21 which is freely inserted into bearing 8 of the support arm 7. Axis 19, shaft 20 and 21 form a compressed torsion axis. In shaft 21 locking holes 23 have been made. The speed sensitive mechanism consist of wing 27, axis and rotation point 26, bar 25 and vertical bar 22. Bar 22 and 25 are connected in a hinge-joint 24.

If speed increases, wing 27 will be lifted; whereas vertical bar 22 will be pushed down and lock the fin at high speed in a position according to the positions of the holes 23. Further rotation at this speed can only take place against the torsion resistance.

In Fig. 6, fin 10 is positioned behind the support arm which will now also allow twist whenever the sailforces increase or decrease. The angle of attack of the fin will increase or decrease in the same proportion if so desired, and the centreline of the board can remain the same even under varying circumstances.

It is also possible to mount the fin behind the support arm, and in that way the angle of attack can be decreased when sailforces increase.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

I claim:

1. A fin, keel or leeboard for a sailboat, vessel or surf board, whose fin, keel or leeboard during use, is mainly in a vertical plane, and said fin, keel or leeboard consists of two sections (11) which extend to both sides of a common connecting plane, whereby said fin (10) is mounted rotationally with respect to a rotation axis (9) which is mounted in said common connecting plane and adjusted substancially parallel to the centreline (13) of said boat or board (1), whereby said rotation axis is connected by means of a support arm(4) to said boat or board (1).

2. A fin according to claim 1 wherein said rotation axis is placed at such a distance from the board/vessel hull that an upright positioned said section (11) of said fin (10) can rotate into a mainly rectangular angle with respect to said board centerline (13).

3. A fin according to claim 1 or 2 wherein the transverse or cross-sections of said sections (11) have the form of asymmetric wing sections, as shown in Fig. 4.

4. A fin according to one of the mentioned claims 1-3, wherein chord (K) of the profile of said fin (10) makes an angle with respect to said rotation axis (9) in such a way that the leading edge of said section (11) when in upright position is further away from said centreline (13) than the trailing edge.

5. A fin according to claim 4 wherein said angle beta between chord (K) and said rotation axis is between 0 - 8 degrees.

6. A fin according to one of the previous claims, wherein said rotation axis (9) makes an relative small said angle with respect to said centreline (13) of said board in such a way that the front side is closer to said centreline (13) than the rear side of said rotation axis (9).

7. A fin according to claim 6 wherein said angle alpha between rotation axis (9) and said centre line (13) is between 0 and 10 degrees.

8. A fin according to one of the previous claims wherein said fin (10) is constructed in such a way that the acting forces take care of the rotation of said fin (10) into the optimum position and can be held it in this position.

9. A fin according to claim 8 wherein said sections (11) are situated in two planes which make an angle with each other.

10. A fin according to one of the previous claims wherein said sections (11) become smaller towards their tip and said sections are put into a slight backwards position.

11. A fin according to one of the previous claims wherein means are mounted to lock the fin in a substancially vertical position of one of said sections (11) in such a way that rotating in a continuing direction after locking can only occur against a certain spring resistance.

12. A fin according to claim 11 wherein said rotation axis (9) on which is mounted said fin (10) is constucted as torsion shaft (19,20,12) wherein the not connected end of said torsion shaft, can perform a rotation of only 180 degrees.

13. A fin according to claim 11 wherein fin (10) is build up and dimentioned in such a way, more specifically the root near to said rotation axis (9), that said sections (11) can perform a change of angle due to the acting forces,

14. A fin according one of the claims 11-13, wherein maintaining in one of said end positions is achieved by means (22-27) which are activated and which function in relation to speed and/or position of said board (1) with respect to the direction of said board(1).

15. A fin according to claim 14 wherein said fin (10) is combined with a mainly horizontal steering wing (27) which is mounted in a liftable way around axis (26)and positioned rectangular with respect to said board centreline (13) whereby a vertical connected axis (22) serves to lock a certain position.

16. A fin according to one of the previous claims wherein the force-result centrepoint of said fin (10) is situated in a plane; vertical and rectangular with respect to said centreline (13) of the board and mainly goes through said support arm (4) which connects said rotation axis (9) with the board.

17. A fin according to one of the previous claims 1-15 wherein the force result centrepoint of fin (10) is situated in a plane; vertical and rectangular with respect to said centreline (13) of board (1) and is substancially positioned before or behind said support arm (4).

18. A fin, substancially as herein described with reference to and as shown in accompanying drawings.

19. A sailboard provided with said fin (10) as claimed in one or more as set in claim 1-18.

FIG. 1

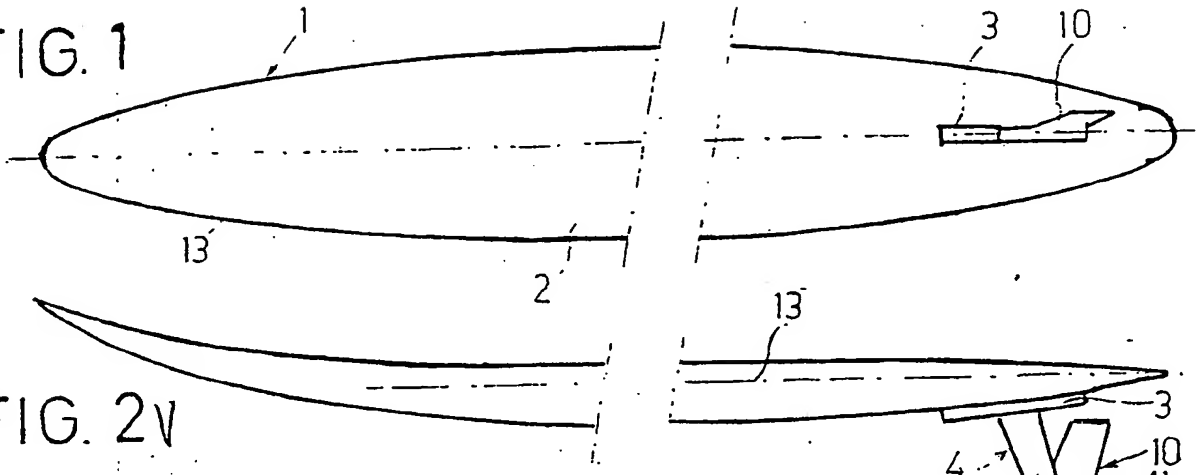
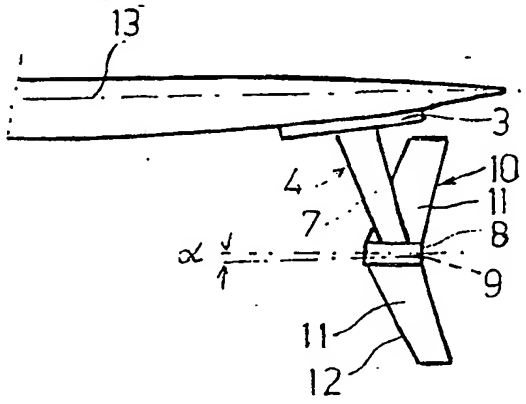


FIG. 2



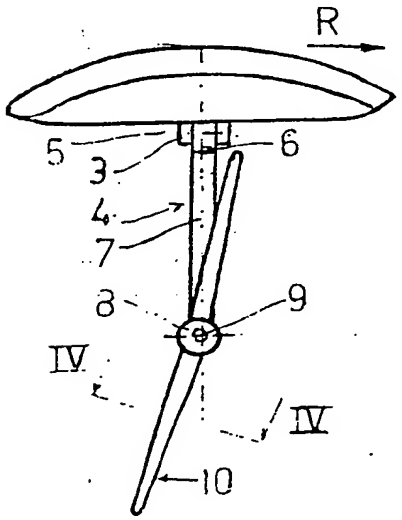


FIG. 3

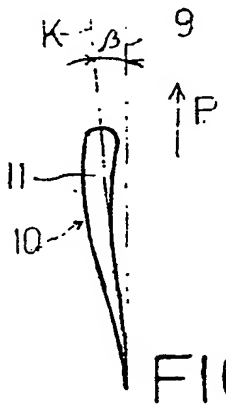


FIG. 4

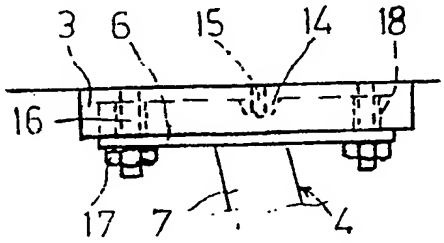
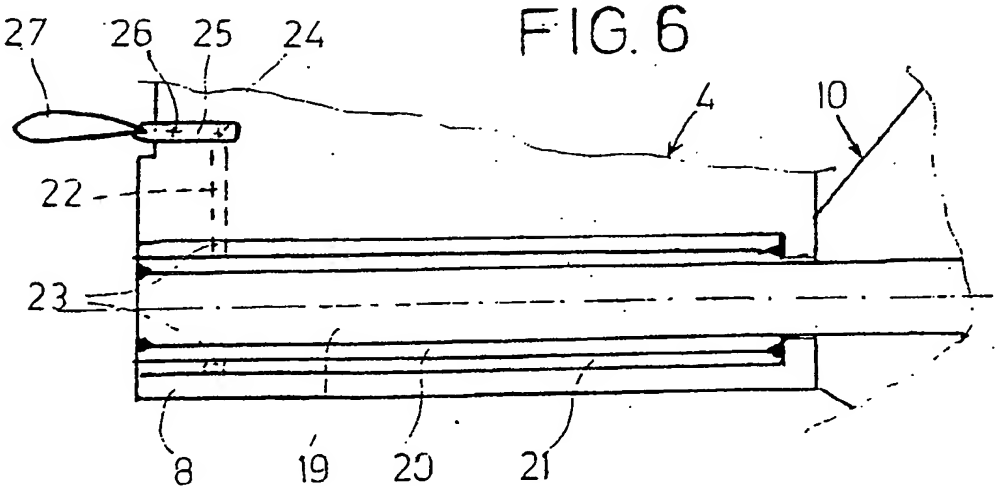


FIG. 5

FIG. 6



INTERNATIONAL SEARCH REPORT

International Application No PCT/NL 88/00026

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: B 63 B 35/86; B 63 B 41/00;

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	B 63 B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
P,X	EP, A, 0264279 (STEWART) 20 April 1988 see the whole document	1,2,3,19
X	BE, A, 894306 (FN) 7 March 1983 see the whole document	1,2,6,7
A	DE, A, 3343579 (BROCKHAUS) 13 June 1985	
A	DE, A, 3109307 (SCOPINICH) 30 September 1982	
A	DE, A, 2932750 (MARKER) 26 March 1981	

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
24th August 1988	16 SEP 1988
International Searching Authority: EUROPEAN PATENT OFFICE	Signature of Authorized Officer: P.C.G. VAN DER PUTTEN

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. NL 8800026

SA 22606

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A- 0264279	20-04-88	AU-A- 7951987 JP-A- 63184592	21-04-88 30-07-88
BE-A- 894306	07-03-83	None	
DE-A- 3343579	13-06-85	None	
DE-A- 3109307	30-09-82	None	
DE-A- 2932750	26-03-81	None	

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